

LightSAR: Mission Concept(s) and Technical Challenges

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Abstract

Like many missions undergoing Phase A studies, NASA's proposed LightSAR mission has taken on a variety of incarnations. Still the basic architecture of an imaging radar mission in Low Earth Orbit has remained unchanged, with the capability to serve both NASA's science data needs and a growing commercial desire for such data.

The core instrument central to all LightSAR mission studies, and first proposed in 1996, is an L-Band polarimetric SAR, capable of operating at medium spatial resolution (25 m), and low spatial resolution (100m). This instrument is designed to meet NASA's science needs in several key areas, including Natural Hazards and Land Use monitoring. To meet commercial needs this core instrument has also included a high resolution (3m) capability. The radar instrument itself, especially the antenna, was required from the beginning to be lightweight in design, in order to fit within existing, inexpensive LEO launch service capabilities.

The core mission requirements, derived from science and commercial requirements, include: the ability to image anywhere on Earth, with an exact repeat of the viewing geometry at intervals less than 10 days; an orbit track controlled to within a couple of hundred meters; visibility for most places on Earth within any 24-hour period; and up to 160 minutes of science data per day.

These core instrument capabilities and mission requirements served as forcing functions for the LightSAR mission design studies, and for the synthesis of key technologies necessary to realize such a mission. This paper will discuss those developments and their significance for future SAR missions.

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